

2  
B

The cycle of propulsion system 120 includes expanding downstream traction module 102 into engagement with the interior of borehole 12 with the upstream traction module 104 in the contracted and non-engaged position. Hydraulic pressure is applied through hydraulic ports 135 applying pressure to ram 128. As pressure is applied against ram 128 which is stationary due to its attachment to engaged traction module 102, housing 106 moves down hole driving bit 140 forwardly upstream. Hydraulic fluid is simultaneously applied through hydraulic port 133 causing contracted upstream traction module 104 to move forward on upstream housing section 112. Upstream traction module 104 moves forward simultaneously with housing 106 moving downhole and actuating the bit 140. Once the downstream traction module 102 reaches the upstream end of tubular cylinder 126, it has completed its forward stroke and is contracted. Simultaneously, upstream traction module 104 has now completed its travel to the downstream end of tubular cylinder 127 and it is in its reset position to start its downward stroke of bit 140. Traction module 104 is then expanded into engagement with borehole 12. As hydraulic pressure is applied through hydraulic port 131 and against upstream ram 129, propulsion system 120 strokes downwardly against bit 140. Simultaneously, downstream traction module 102 is contracted and reset by applying hydraulic pressure through upstream port 132. The cycle is then repeated allowing the propulsion system 120 to move continuously downstream in one fluid motion and provide a downward pressure on drill bit 140. Each stroke approximates the length of housing sections 108, 112.

The Abstract paragraph on page 57.

3  
B

A drilling system includes a work string supporting a bottom hole assembly. The work string including lengths of pipe having a non-metallic portion. The work string preferably includes a composite umbilical having a fluid impermeable liner, multiple load carrying layers, and a wear layer. Multiple electrical conductors and data transmission conductors are embedded in the load carrying layers for carrying current or transmitting data between the bottom hole assembly and the surface. The bottom hole assembly includes a bit, a gamma ray and inclinometer instrument package, a propulsion system with resistivity antenna and steerable assembly, an electronics section, a transmission, and a power section for rotating the bit. The electrical conductors in the composite